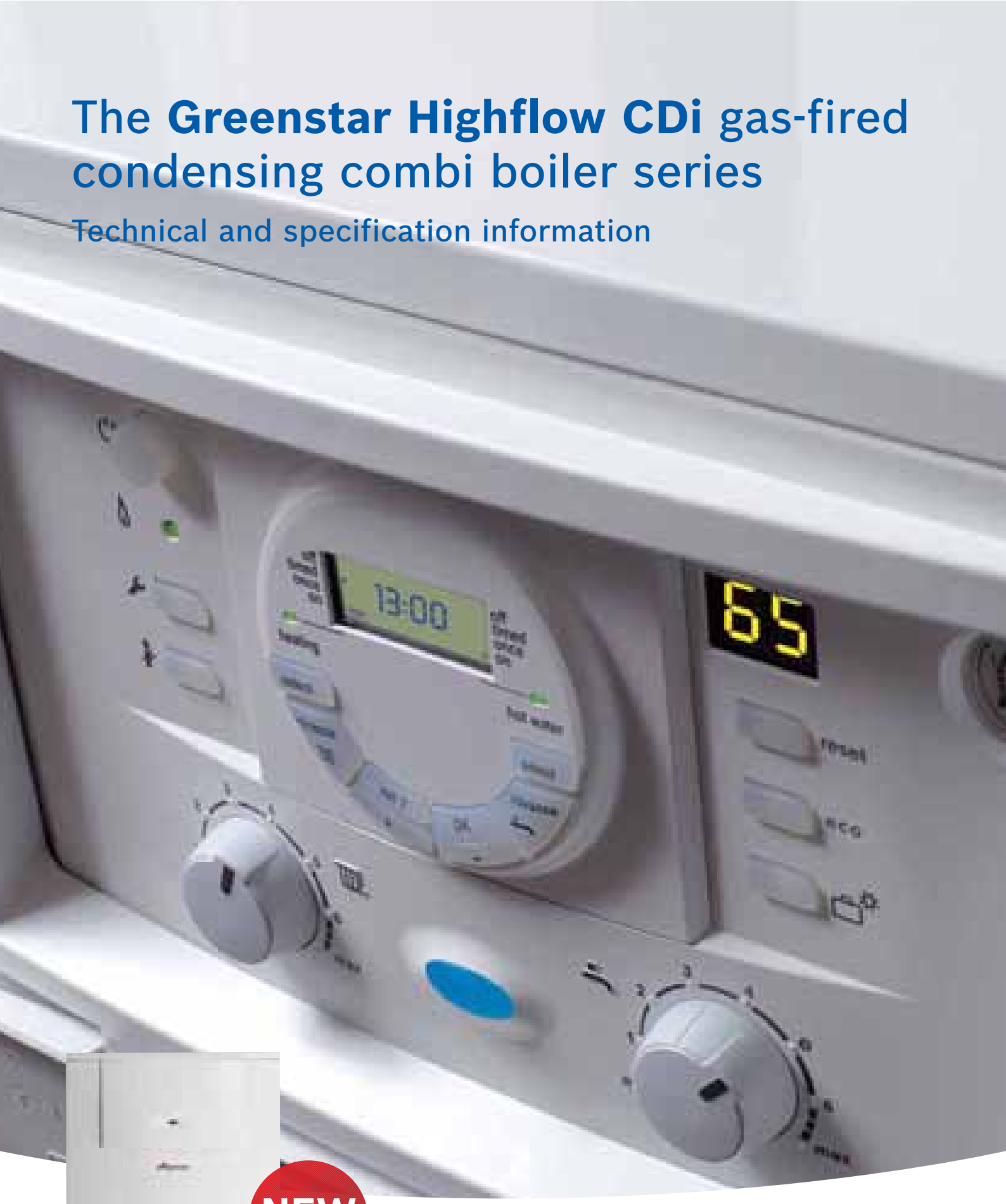
The **Greenstar Highflow CDi** gas-fired condensing combi boiler series

Technical and specification information



NEW PRODUCT

WORCESTER
Bosch Group

Worcester, Bosch Group headquarters

Worcester and you. Making a difference.

BOSCH
Invented for life

Working together for many years, heating professionals and Worcester have been making a real difference in hundreds of thousands of homes across the UK. We are recognised as a market leader in high efficiency, condensing boiler technology and are also committed to providing renewable energy solutions.

As part of the Bosch Group, our products are designed and manufactured to provide the high levels of quality and reliability which are synonymous with the Bosch name throughout the world.

We're a leading British company, employing approximately 2,000 people at our headquarters and manufacturing plants in Worcester and at Clay Cross in Derbyshire, including a nationwide network of over 300 Service Engineers and over 80 technically-trained Field Sales Managers.

As part of Europe's largest supplier of heating products, Worcester, Bosch Group has the UK-based resources and support capability to offer you the value-added solutions we feel you deserve.

"At Worcester we recognise the vital role you, our customer, has in the specification and installation of 'A' rated, energy efficient appliances in homes across the UK. We will continue to invest in our products, people, facilities and added value services such as training, to give you the support you require in providing a total solution for your customers' comfort."

Richard Soper,
Managing Director, Worcester, Bosch Group

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The Greenstar Highflow CDi condensing combi boiler series

The Greenstar Highflow CDi series is part of a market leading range of energy-saving condensing floor standing gas-fired combi boilers.

Higher efficiency therefore highly cost effective

All of the new Greenstar Highflow CDi condensing combi boilers are SEDBUK A rated. This means they have an average annual efficiency of 90.8%, standard efficiency boilers achieve around 78% efficiency. Therefore by upgrading to a Greenstar Highflow CDi boiler, consumers can reduce their gas bills as well as their carbon footprint.

The Greenstar Highflow CDi condensing boiler series delivers this energy-saving performance by recycling exhaust gases to extract the latent heat – a highly efficient use of energy which also significantly reduces carbon dioxide emissions into the atmosphere.

To all these major benefits you can add yet more: renowned Worcester quality and reliability; outputs and flow rates to comfortably satisfy the heating and hot water demands of the larger household and all-round value for money.

The Greenstar Highflow CDi combi series at a glance

		Greenstar Highflow 440CDi	Greenstar Highflow 550CDi
Output kW to DHW	Min	7.4kW	9.7kW
	Max	29.5kW	41.1kW
Flow rate at 35ºC Δ T		20l/min*	25l/min*
CH temperature control		•	•
DHW temperature control		•	•
Natural gas		•	•
LPG boiler		•	•
Electronic ignition		•	•
SEDBUK band		A (90.8%)	A (90.8%)

**Provided adequate mains water pressure and flow is available – see page 29 for further details*

UNIQUE NEW FEATURES

Features		Benefits
20 & 25 litre/minute flow rate	NEW	Suitable for larger family homes
Built-in condensate pump – 4.5m head	NEW	Increases siting possibilities
Earth bonding strip		Labour and money saving
Roll-in boiler		Minimises risk of damaging floors
Built-in filling link		Labour and money saving
Temperature control for CH + DHW		Consumer-friendly and energy saving
Multi-directional Condensfit II fluing – compatible with plume management		Siting flexibility
Floor mounted pre-plumbing jig		Allows pre-filling of system and no pipe fabrication required
Electronic ignition		Energy saving
Built-in frost protection		Money saving, economical protection
Pump seizure protection		Prevents call-backs
Fault finding diagnostics		Time saving
Anti-cycle device		Energy saving
No ventilation grilles required in compartments		Labour and money saving
Optional plug-in twin channel programmer		No electrician required

The Greenstar Highflow CDi condensing combi boiler series

A condensing boiler is more efficient due to its ability to extract more heat from the flue gases normally lost to the environment through the flue system.

Greenstar Highflow CDi combis use a proven aluminium-silicon heat cell with an extra large surface area.

As the flue gases pass through the heat exchanger this extra surface area cools the flue gases to around 55°C at which point the latent heat within is released. This is heat that would normally be lost to the atmosphere.

It is this ability to extract as much heat as possible from the gas it burns that gives Greenstar Highflow CDi combis an exceptionally high level of operating efficiency.

This higher efficiency is recognised within section L of the Building Regulations, subsequently achieving a higher SAP or NHER rating.

The separate plated DHW heat exchanger combined with the thermal store ensures that hot water is delivered instantly to the outlet being operated.

Modulating central heating and hot water outputs combined with separate consumer controls, also mean that comfortable temperature levels for both can be set independently of each other.

Greenstar Highflow CDi combis are supplied as standard suitable for sealed primary water systems. The appliance contains a 12 litre expansion vessel, 3bar pressure relief valve, pressure gauge and an automatic air vent. The appliance cannot be used on an open vent system.

Fluing

Greenstar Highflow CDi combis are available as a multi-directional room-sealed fanned flue appliance.

Gas

The Greenstar Highflow CDi is manufactured in both natural gas and Liquid Petroleum Gas (LPG) variants.

The advantages of a combi boiler

A combi (or combination boiler) is a compact and highly efficient unit giving all the heating and hot water you need, with significant savings on running and installation costs.

Unlike a conventional heating and hot water system, a combi boiler system does not store domestic hot water. It heats water directly from the cold water mains – as you use it. There's no hot water cylinder, no tank in the loft (and so less risk of freezing and flooding), and none of the connecting pipework.

So you not only save space, but also reduce hot water costs – which can account for up to 60% of a typical domestic fuel bill.

A combi also supplies hot water at mains pressure, giving you powerful showering without the need for a pump. And as, on average, a shower uses considerably less water than a typical bath, the savings on hot water costs and water consumption can be significant.

Regular boiler layout

Combi boiler layout

Operation

Hot water mode

With the appliance in a standby condition, i.e. thermal store or heatbank at temperature set by the hot water thermostat, a demand for hot water will cause the flow turbine to energise the pump and circulate primary hot water around the boiler and the plated water to water heat exchanger. The burner will ramp-up at its maximum setting and modulate accordingly to maintain the temperature of the heatbank.

When hot water is no longer required the appliance will continue to operate until the heatbank has returned to the required temperature.

Priority is always given to the production of domestic hot water. Should the central heating be in operation when a hot water demand is made, the supply to the radiators will be temporarily interrupted.

Central heating mode

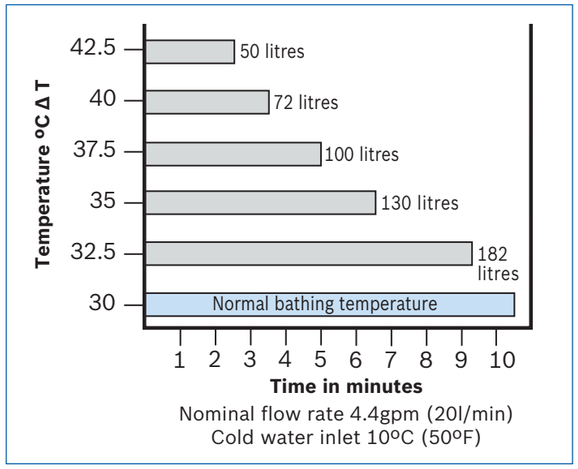
On a demand for central heating the pump will energise, the diverter valve will open and primary water will circulate around the heating system. The burner will light at the minimum setting and ramp upwards to meet the system demand. The radiators will heat up to the temperature set by the fascia mounted heating temperature controller (assuming there are no TRVs on the radiators).

Application of Greenstar Highflow CDi combis

- Worcester Greenstar Highflow CDi combis deliver domestic hot water at a flow rate of 20 litres/min (4.4gpm) & 25 litres/min (5.5gpm), making the appliances ideally suited for use in medium to large sized family homes, incorporating up to three bathrooms
- As the Worcester Greenstar Highflow CDi combis deliver hot water at mains pressure, they are ideally suited to providing a powerful shower
- Worcester Greenstar Highflow CDi combis can be sited where space and water storage is a problem
- Worcester Greenstar Highflow CDi combis may be used to provide domestic hot water only, with radiators being added at a later date
- The fluing options available with Greenstar Highflow CDi combis, both horizontal and vertical, offer excellent scope for siting the appliance, particularly in kitchens, airing cupboards, etc
- Worcester Greenstar Highflow CDi combis can be sited underneath a worktop as servicing can be undertaken from the front. A removable section of worktop is recommended should you require top access for maintenance work

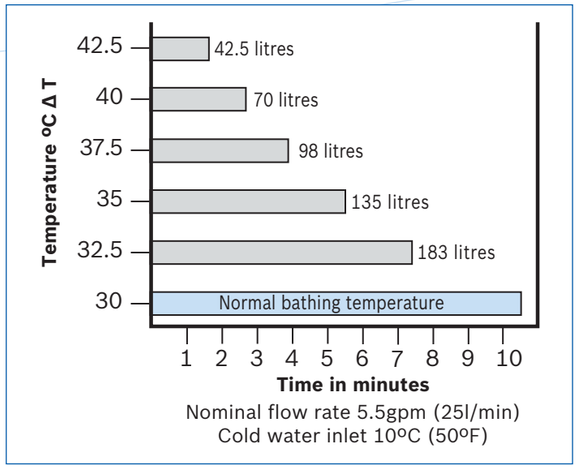
Hot water performance

Greenstar Highflow 440CDi



Nominal flow rate 4.4gpm (20l/min)
Cold water inlet 10°C (50°F)

Greenstar Highflow 550CDi



Nominal flow rate 5.5gpm (25l/min)
Cold water inlet 10°C (50°F)

Fluing

Greenstar Highflow CDi combis feature 2 different sizes of multi-directional RSF flue systems, 100mm or 125mm dia.

The flue can be run horizontally or vertically with additional 90° or 45° in-line bends allowing changes of route or direction, providing an extremely flexible and versatile fluing system enabling the appliance to be sited virtually anywhere. More details are shown on page 20.

Optional plug-in controls

Greenstar Highflow CDi floor standing condensing combi boilers are available with a range of easy-to-use controls. These fascia-mounted controls offer simple plug-in connection to the boiler circuit board.

Mechanical timers

MT10 mechanical timer
The simplest Worcester control device – an easy-to-use analogue clock for setting heating time periods. It plugs into the boiler fascia via a pre-prepared plug and socket.

MT10RF mechanical RF thermostat
Has an analogue display for setting night and day time periods and temperature. The receiver plugs into the boiler and is activated remotely by the RF (radio frequency) controller, which requires no wiring. So installation is clean and simple – no disturbance to floorboards or carpets. Nor is there any need for a separate room thermostat.

These mechanical timers do not control domestic hot water pre-heat. If this function is required please select a digital programmer. Alternatively, an additional single channel timer for hot water control, could be wired in remotely.

Digital and wireless programmers and room thermostats

DT20RF digital RF thermostat with twin channel programmer
A wall-mounted RF room thermostat with digital display, combined with a twin channel digital timer in the boiler fascia. The fascia mounted programmer benefits from automatic time and date setup, automatic summer/wintertime changeover and a backlight for use in low light conditions.

DT20 twin channel digital programmer
A versatile, easy-to-learn, 7 day, digital programmer offering up to 3 on/off settings per day. The programmer has a host of innovative features including automatic setup, which sets the correct time and date at power-up, automatic summer/wintertime changeover and a green backlight for use in low light conditions.

DT10RF digistat
A familiar wall-mounted 24 hour programmable RF digital thermostat combined with a fascia mounted single channel programmer to time the hot water combi preheat functions. The programmer includes a built-in receiver for the room thermostat and all of the functionality of the DT20.

DT10RF optimiser
A seven day digital programmable RF thermostat with a seven day programmer/receiver in the boiler fascia for hot water. The transmitter is the tried and tested Optimiser as available with other Worcester boilers. The optimum start feature, where the thermostat delays the firing of the boiler until necessary, is a useful energy-saving option.

TD200 text display*
A seven day programmer with easy-to-use text display with automatic time and date setup, automatic summer/winter time changeover and a backlight for use in low light conditions. Three on/off periods can be set per day. The TD200 can be fascia mounted or hard wired outside the boiler using the optional wall mounting socket. The TD200 features an easy-to-use full text display providing more information than standard digital controls. A hard wired room thermostat is available to provide optimum start functionality.

RT10 room thermostat*
A hard wired optimising room temperature controller with digital display for use with the TD200. The display shows current and desired temperature and an advance button allows the user to move to the next heating switch point.

TD200 wall mounting socket*
A Worcester branded wall mounting socket which allows the TD200 to be hard wired away from the boiler.

**All three of the above are classed as an Intelligent Combi package.*

Increased SAP ratings

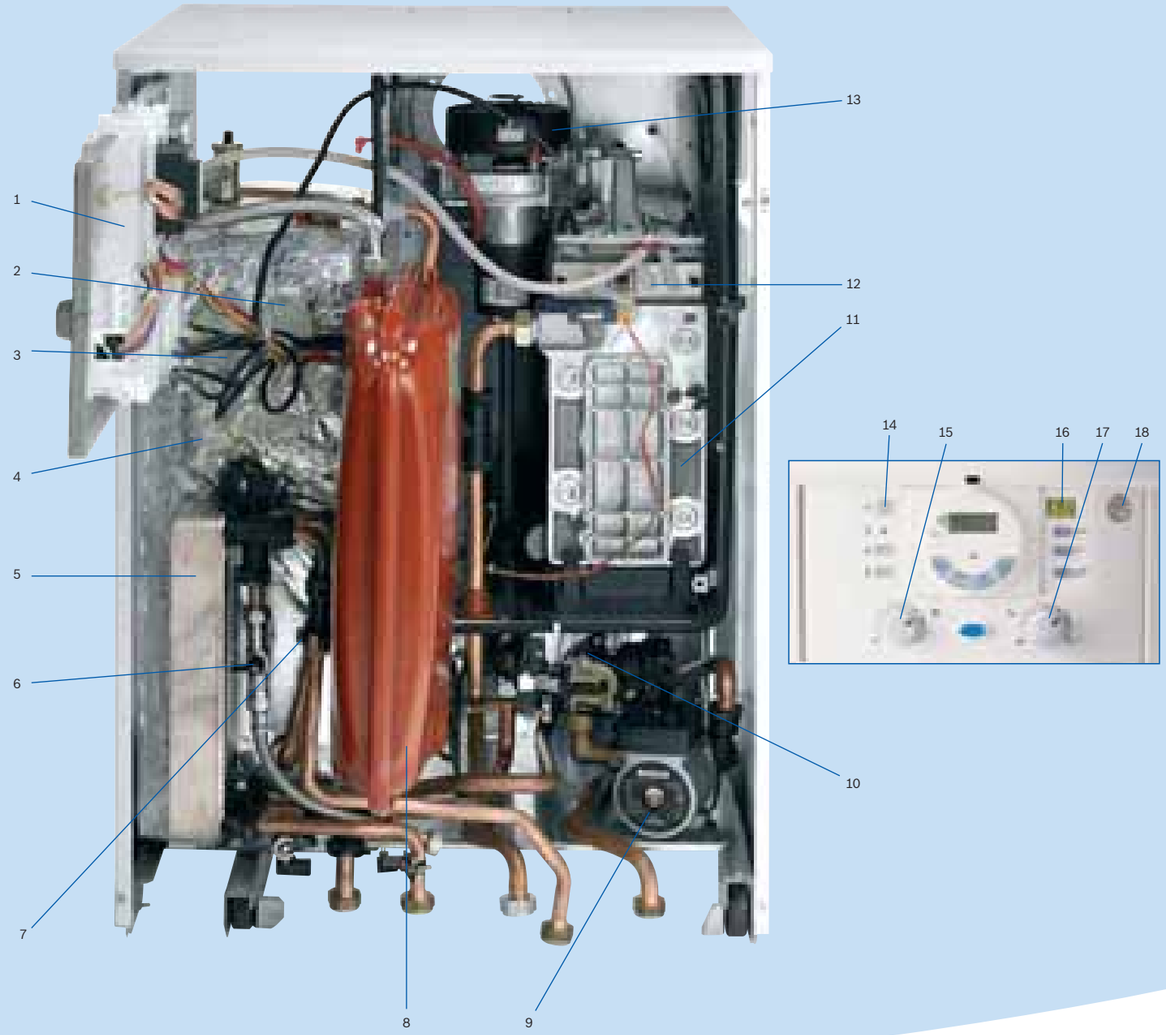
As well as the Greenstar Highflow CDi appliances achieving very high SAP ratings for dwellings, the addition of the optimising temperature controller further increases these ratings as well as being part of the recommended best practice, as covered by the CHeSS design standard.

TD200 text display

Technical data – Greenstar Highflow CDi series

Model	Greenstar Highflow 440CDi	Greenstar Highflow 550CDi
Height (mm)	850	850
Width (mm)	600	600
Depth (mm)	600	600
Weight – dry (kg)	112	112
SEDBUK value % / band – natural gas	90.8%/Band A	91%/Band A
SEDBUK value % / band – LPG	92.2%/Band A	92.2%/Band A
Heating flow / return connections	22mm compression	22mm compression
Hot / cold water connections	22mm compression	22mm compression
Pressure relief valve (mm dia.)	15	15
Condensate connection	22mm plastic pipe	22mm plastic pipe
Gas connection	22mm compression	22mm compression
Primary water content (litres)	51	51
Min. domestic inlet pressure for max. DHW flow rate (bar)	1.5	1.7
Min. domestic inlet pressure to operate the appliance (bar)	0.5	0.5
Max. domestic inlet pressure (bar)	10	10
DHW flow rate @ 35ºCΔT (l/min)	20	25
Output to central heating kW (Btu)	7.4 - 29.2 (25,590 - 99,630)	9.7 - 30.6 (33,096 - 104,407)
Floor mounted pre-plumbing jig	•	•
Filling link	•	•
Plug-in timer	• (optional)	• (optional)
Condensate disposal pump	•	•
Fault diagnostic display	Digital	Digital
Max. vertical flue (mm) (100mm dia.) inc. terminal	6,400	6,400
Max. vertical flue (mm) (125mm dia.) inc. terminal	15,000	15,000
Max. horizontal flue (mm) (100mm dia.)	4,000	4,000
Max. horizontal flue (mm) (125mm dia.)	13,000	13,000
NOx classification	Class 5	Class 5

The Greenstar Highflow CDi condensing combi boiler series – inside story



Key to components

1. Control panel
2. Tank over heat thermostat
3. Tank temperature sensor
4. Heat store
5. Plate DHW heat exchanger
6. Filling loop isolation valve
7. Water flow sensor turbine
8. Expansion vessel
9. Circulating pump
10. Gas valve
11. Heat cell
12. Gas burner/spark electrodes
13. Combustion air modulating fan
14. On/off button
15. Central heating temperature control
16. Digital display
17. Domestic hot water temperature control
18. Pressure gauge

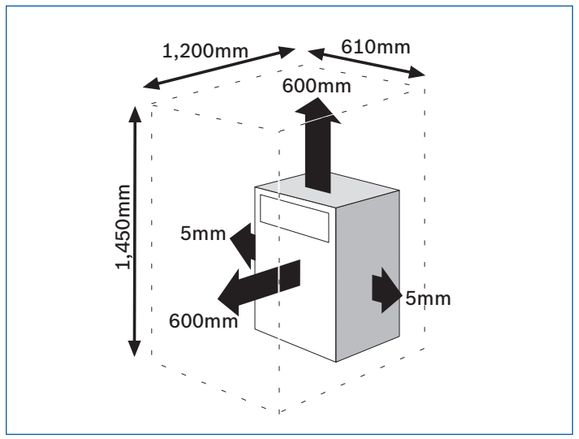
Installing the Greenstar Highflow CDi series

Siting of appliance

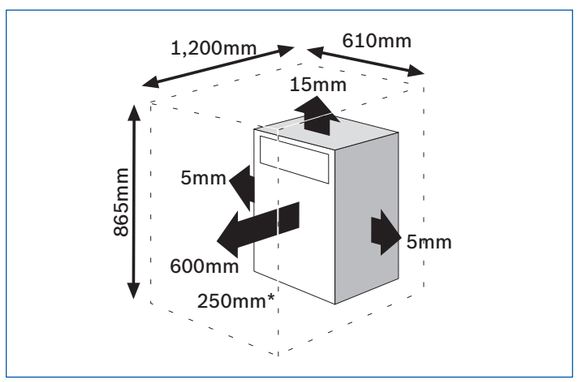
General
The appliance is not suitable for external installation. The floor on which the boiler is to be mounted should be capable of supporting an overall weight of approximately 160kg.

Clearances
The following clearances should be allowed for installation and servicing.

Installation clearances
The minimum space required to install the boiler only.



Service clearances
The minimum space required to service the boiler only.



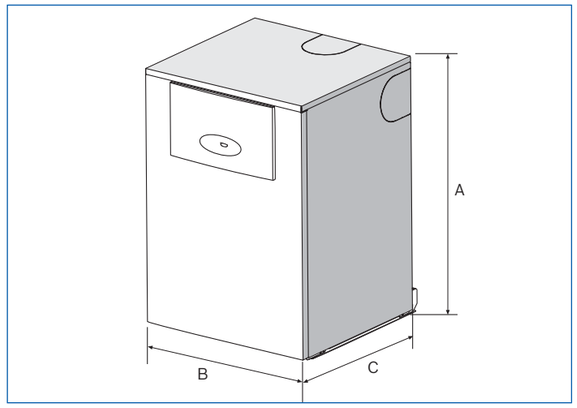
**Space required for unvented areas with a removable door or panel*

Site preparation/portability

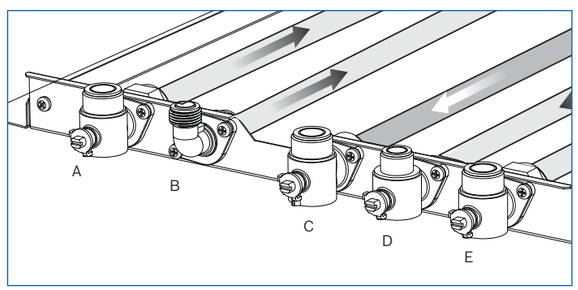
Greenstar Highflow CDi appliances are supplied with a floor mounted pre-plumbing jig. The jig enables all gas and water services to be pre-plumbed and tested prior to fitting the boiler.

For ease of installation the appliance has a roll-in boiler tray which allows it to be rolled into place once the connections have been made.

Pipework connections and casing dimensions



Cabinet dimensions (mm)	
A	850
B	600
C	600



Pipework connections		
A	CH flow	22mm
B	DHW flow	22mm
C	Gas inlet	22mm
D	Cold main inlet	22mm
E	CH return	22mm

Condensate disposal

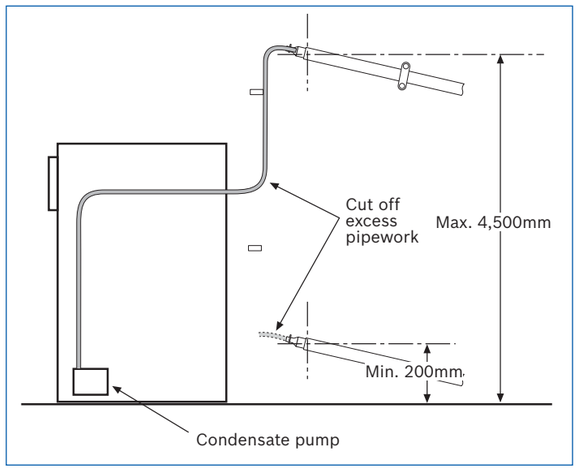
All condensing boilers generate condensate discharge which needs to be piped away from the appliance using a plastic pipe.

The amount of condensate generated depends on the efficiency and operating status of the appliance. Depending on operating temperatures, the appliance will condense in both heating and hot water modes and may generate up to 2.7 litres of condensate per hour for the 440CDi and 3.7 litres per hour for the 550CDi.

Condensate termination and route

Greenstar Highflow CDi combis incorporate a condensate pump which allows condensate to be plumbed above the boiler, allowing more flexible siting possibilities.

Condensate connection
The condensate pump fills up and periodically discharges through the flexible condensate pipe between 200mm and 4,500mm from floor level. After this point the condensate continues down the 22mm rigid pipework to the outlet using gravity.



- The flexible plastic pipe can be reduced in length to suit the installation circumstances. The pipework must follow one of the options shown on the next page.

Never terminate or discharge into any open source, including: sink, bath, shower, bidet, toilet etc.

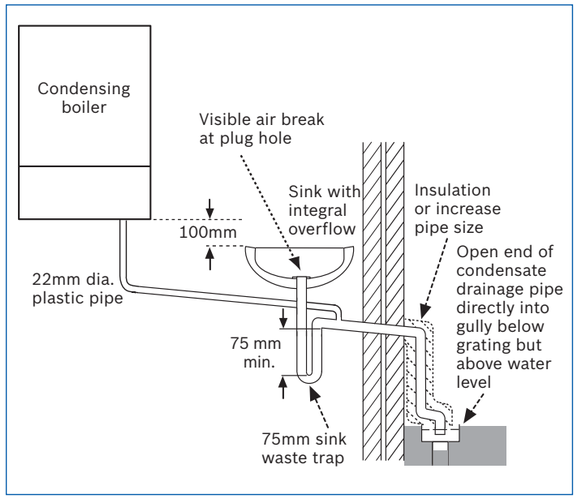
Note: any external condensate pipework should be protected with weather resistant insulation to help prevent freezing.

The condensate connection on Worcester appliances is in 22mm polypropylene. The pipe should be extended and run away from the appliance with a constant fall of 3º or at least 50mm in every metre away from the boiler.

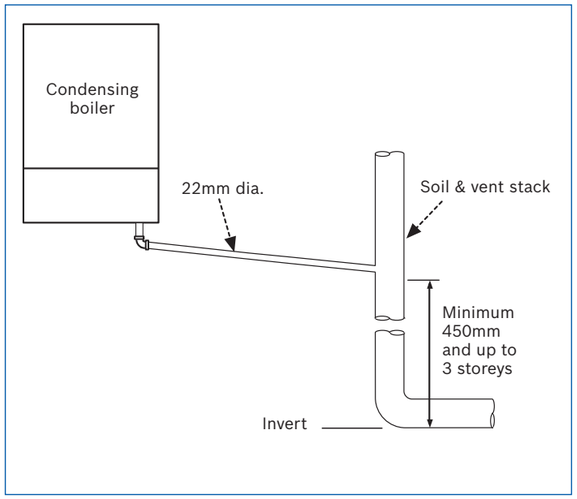
The condensate pipe can terminate into any one of four areas (see next page).

Whilst all of the methods are acceptable it is best practise to terminate the condensate pipe via an internal waste system. This will eliminate the need for any external condensate pipe runs which can be susceptible to freezing in extreme weather. Best practise is not to run external condensate pipe any further than 3m. If it is necessary to run more than 3m externally increase pipe size to 32mm.

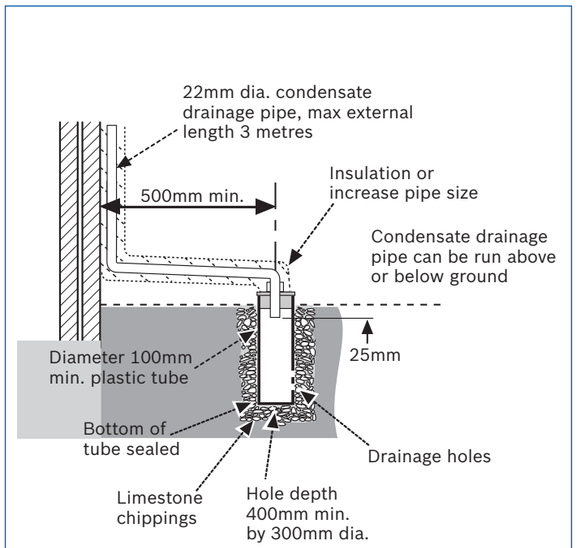
Condensate termination and route


Condensing boiler
Visible air break at plug hole
Sink with integral overflow
Insulation or increase pipe size
100mm
Open end of condensate drainage pipe directly into gully below grating but above water level
22mm dia. plastic pipe
75 mm min.
75mm sink waste trap

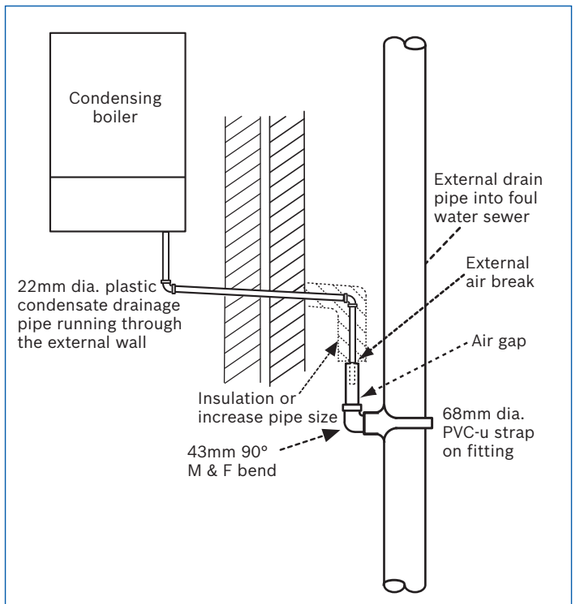
Internal sink/washing machine drain



Soil and vent stack


22mm dia. condensate drainage pipe, max external length 3 metres
500mm min.
Insulation or increase pipe size
Condensate drainage pipe can be run above or below ground
25mm
Diameter 100mm min. plastic tube
Bottom of tube sealed
Drainage holes
Limestone chippings
Hole depth 400mm min. by 300mm dia.

External condensate absorption point (unsuitable for clay soil types)


Condensing boiler
External drain pipe into foul water sewer
External air break
22mm dia. plastic condensate drainage pipe running through the external wall
Air gap
Insulation or increase pipe size
68mm dia. PVC-u strap on fitting
43mm 90° M & F bend

External air break when using a foul water down pipe

External condensate pipework

The Worcester Greenstar Highflow CDi appliances have a condensate pump rather than a syphonic condensate trap. Rather than the condensate constantly dripping into the discharge pipe, the condensate is collected in the pump which releases it in 100ml quantities. This will help prevent freezing occurring.

Wherever possible the condensate discharge pipework should be routed and terminated internally. Should this not be possible, and the only available route is external, the following conditions should be observed:

- The pipework length should be kept to a minimum and the route as vertical as possible
- Where pipework could be subjected to extreme cold or wind chill, a weather proof insulation should be used. **Alternatively, the condensate pipework could be increased to a minimum 32mm.**

Compartment installation

The appliance may be installed in any room, although particular attention is drawn to the requirements of the IEE regulations applicable and in Scotland the electrical provisions with respect to installation in a room containing a bath or shower.

Air supply

1. The room in which the appliance is installed does not require a dedicated air vent.

2. If the appliance is installed in a cupboard or compartment with dimensions that allow the following minimum clearances, then no ventilation is required:

Compartment installation	
Position of appliance	**Min. unventilated clearance**
In front	75mm*
Right side	100mm
Left side	100mm
Above flue elbow/casing	50mm

**75mm from an opening door. 600mm is required for servicing*

Boiler location and clearances

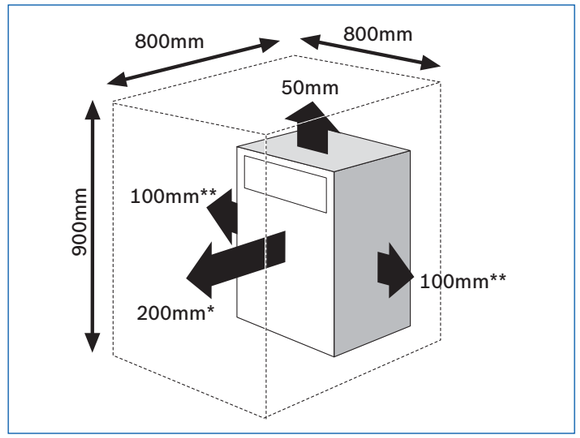
This boiler is only suitable for installing internally within a property at a suitable location on a fixed, rigid non-combustible surface of at least the same size as the boiler and capable of supporting the boiler weight.

Compartments: Follow the requirements of BS 6798 and BS 5440 Part 2 and note:

- Minimum clearances must be maintained
- An access door is required to install, service and maintain the boiler and any ancillary equipment
- If fitting the boiler into an airing cupboard use a non-combustible perforated material (maximum hole sizes of 13mm) to separate the boiler from the airing space.

Unvented compartment clearances

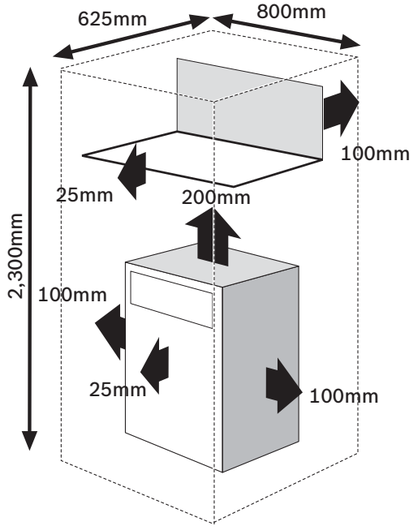
The diagram shows the minimum space required to install and service the boiler inside an unvented compartment.



**Space required for unvented areas with a removable door or panel.*
***This space can be reduced to 50mm for one side only as along as both the side clearances add up to the total of both the side measurements shown or more.*

Airing cupboard clearances

The diagram below shows the minimum space required to install and service the boiler within an airing cupboard.



Venting compartments

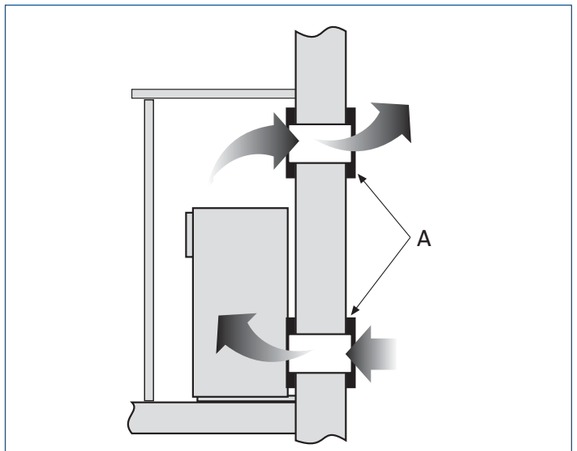
If the clearances are less than those stated for the options above then ventilation must be provided as described in BS 5440.

A minimum of 2 air vents (A) must be fitted, one at low level and another at high level onto the same wall using the same air for circulation.

Minimum free air required for venting:

- For air directly from outside:
  440CDi 155cm² per vent
  550CDi 220cm² per vent

- For air from internal space/room:
  440CDi 310cm² per vent
  550CDi 440cm² per vent



Boiler location & clearances

Bathrooms

IMPORTANT:

Any switch or appliance control using mains electricity must not be within reach of a person using the bath or shower.

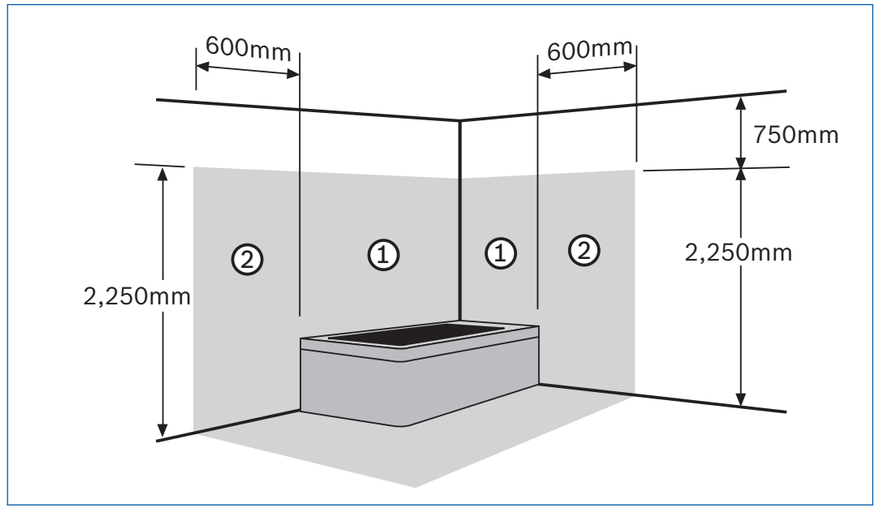
Electrical switches, fused spurs and socket outlets must not be situated in the bathroom.

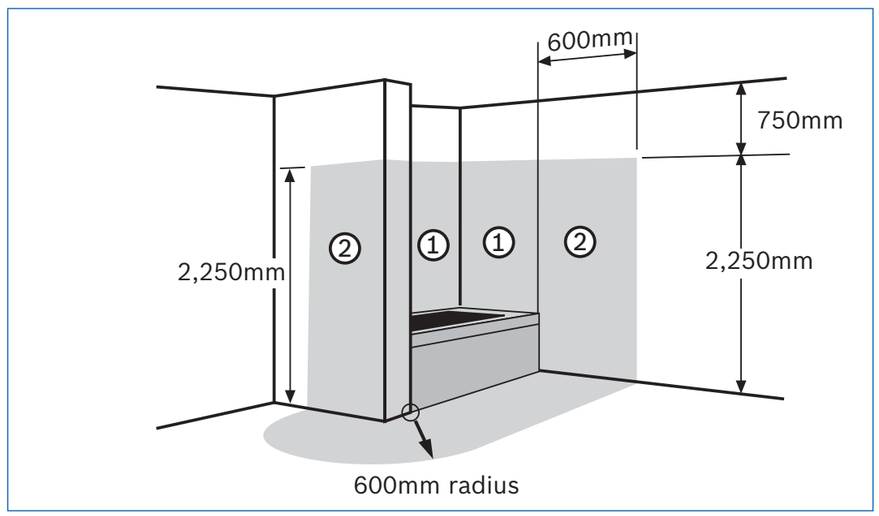
A boiler fitted with a non-mechanical timer or with no timer can be installed in zone 2 or outside the shaded area.

A boiler with a mechanical timer or RF mechanical timer with a room thermostat must only installed outside the shaded area.

Additional Residual Current Device (RCD) protection may be required.

Refer to the latest IEE wiring regulations.





Flue terminal positioning

General position

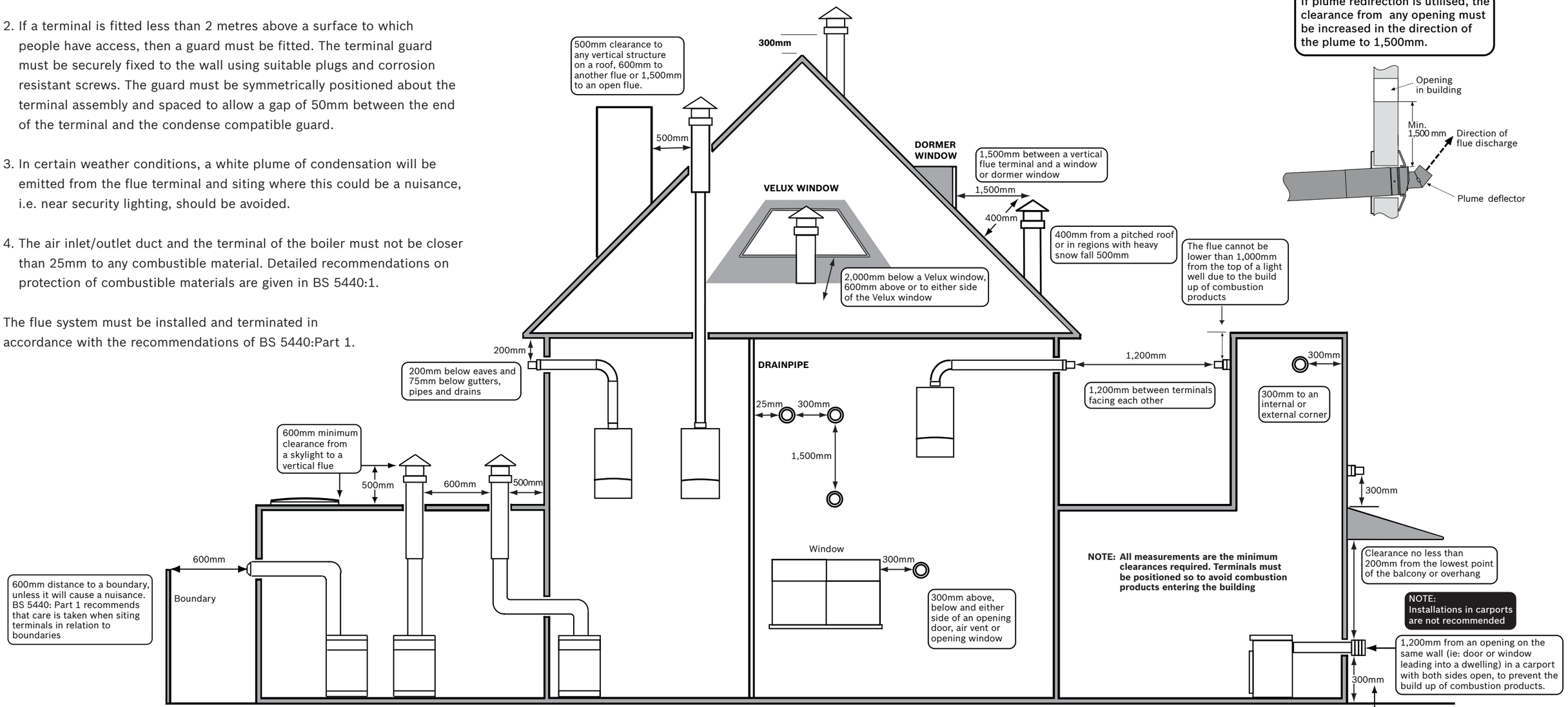
1. The terminal must not cause an obstruction nor the discharge a nuisance. Particular care should be exercised with regards to the pluming of the flue gases and any increase in noise levels.

2. If a terminal is fitted less than 2 metres above a surface to which people have access, then a guard must be fitted. The terminal guard must be securely fixed to the wall using suitable plugs and corrosion resistant screws. The guard must be symmetrically positioned about the terminal assembly and spaced to allow a gap of 50mm between the end of the terminal and the condense compatible guard.

3. In certain weather conditions, a white plume of condensation will be emitted from the flue terminal and siting where this could be a nuisance, i.e. near security lighting, should be avoided.

4. The air inlet/outlet duct and the terminal of the boiler must not be closer than 25mm to any combustible material. Detailed recommendations on protection of combustible materials are given in BS 5440:1.

The flue system must be installed and terminated in accordance with the recommendations of BS 5440:Part 1.

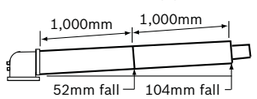

500mm clearance to any vertical structure on a roof, 600mm to another flue or 1,500mm to an open flue.
300mm
500mm
DORMER WINDOW
1,500mm between a vertical flue terminal and a window or dormer window
1,500mm
400mm
400mm from a pitched roof or in regions with heavy snow fall 500mm
VELUX WINDOW
2,000mm below a Velux window, 600mm above or to either side of the Velux window
The flue cannot be lower than 1,000mm from the top of a light well due to the build up of combustion products
200mm
200mm below eaves and 75mm below gutters, pipes and drains
DRAINPIPE
25mm
300mm
1,500mm
1,200mm
1,200mm between terminals facing each other
300mm
300mm to an internal or external corner
600mm minimum clearance from a skylight to a vertical flue
500mm
600mm
500mm
300mm
600mm
Boundary
600mm distance to a boundary, unless it will cause a nuisance. BS 5440: Part 1 recommends that care is taken when siting terminals in relation to boundaries
Window
300mm
300mm above, below and either side of an opening door, air vent or opening window
NOTE: All measurements are the minimum clearances required. Terminals must be positioned so to avoid combustion products entering the building
Clearance no less than 200mm from the lowest point of the balcony or overhang
NOTE: Installations in carports are not recommended
1,200mm from an opening on the same wall (ie: door or window leading into a dwelling) in a carport with both sides open, to prevent the build up of combustion products.
300mm
Flue clearances must be at least 300mm from the ground. Terminal guards must be fitted if the flue is less than 2 metres from the ground or if a person could come into contact with the flue terminal.

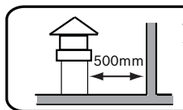
NOTES:

Plume management kits are available for 100mm horizontally terminated flues. Please refer to the installation instructions supplied with the plume management kits.

If plume redirection is utilised, the clearance from any opening must be increased in the direction of the plume to 1,500mm.

The flue turret has a built-in angle of 3° to ensure that the condensate flows back to the boiler for safe disposal via the condensate waste pipe. All horizontal flue sections must rise by 3° or at least 52mm for each metre away from the boiler to ensure condensate flows back into the boiler.





Vertical flue clearance 500mm to non-combustible building material, and 1,500mm clearanceto combustible building material

Greenstar Highflow CDi combi boiler horizontal fluing options

Greenstar Highflow CDi combis offer a choice of 2 different sized horizontal RSF flue systems, 100mm diameter and 125mm diameter. The systems have different maximum lengths. Options 1 to 8 detail the permissible lengths.

Horizontal RSF flue

Flue diameter	100mm	125mm
Minimum flue length	130mm	350mm
Maximum flue length	4,000mm	13,000mm

100mm dia. telescopic flue kit
Comprises:
1 x internal flue connector bend
1 x flue adaptor
1 x flue connector
2 x wall cover plates
530mm (100mm dia.) of flue duct including terminal
Part No. 7 716 191 155

125mm dia. standard flue kit
1 x internal flue connector bend
1 x flue adaptor
1 x flue connector
2 x wall cover plates
965mm (125mm dia.) of flue duct including terminal
Part No. 7 716 191 157

Accessories

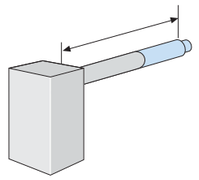
Components	Part no.	Description
	7 716 191 155	60/100 530mm Horizontal telescopic kit
	7 716 191 083	60/100 1m extension
	7 716 191 084	60/100 90º bend
	7 716 191 085	60/100 45º bend
	7 716 191 133	60/100 Short flue extension
	7 716 191 164	60/100 Vertical flue adaptor
	7 716 191 157	80/125 965mm Horizontal flue kit
	7 719 001 892	80/125 1m extension
	7 719 001 891	80/125 90º bend
	7 719 001 899	80/125 45º bend
	7 716 191 165	80/125 Vertical flue adaptor

**The 100mm flue system inclines 2º within the 100mm terminal.*

The following criteria should be noted when planning the installation.

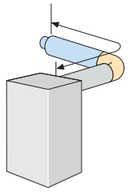
- The concentric flue system must be inclined at 3º (52mm per metre) from the appliance, to allow condensate to drain back into the boiler.
- Because the appliance operates at high efficiency a white plume of condensation will be emitted from the terminal. Care must be taken when selecting the flue terminal position (see pages 18 - 19).

Option 1
Extension rear flue horizontal flue assembly



Maximum length (m)		Components required	
60/100	4	1	up to 4
80/125	13	1	up to 12

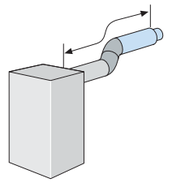
Option 2
Extension rear flue horizontal using a 90º bend



Maximum length (m)		Components required		
60/100	2.5	1	up to 2	1
80/125	11	1	up to 10	1

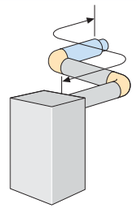
Deduct 750mm off the total flue length for every 45º bend used.
Deduct 1,500mm off the total flue length for every 90º bend used.

Option 3
Extension rear flue horizontal using 45º bends



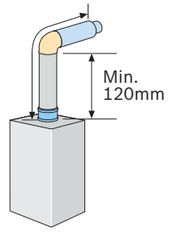
Maximum length (m)		Components required		
60/100	2.5	1	up to 2	2
80/125	11	1	up to 10	2

Option 4
Extension rear flue horizontal using a second 90º bend



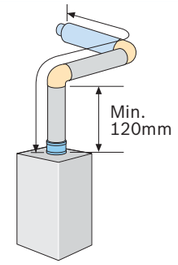
Maximum length (m)		Components required		
60/100	1	1	up to 2	2
80/125	9	1	up to 8	2

Option 5
Extension flue upwards and horizontal



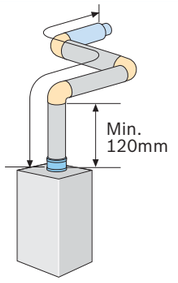
Maximum length (m)		Components required			
60/100	2.5	1	up to 2	1	1
80/125	11	1	up to 10	1	1

Option 6
Extension flue upwards and horizontal using a second 90º bend



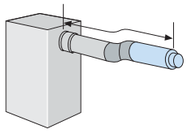
Maximum length (m)		Components required			
60/100	1	1	up to 2	2	1
80/125	9	1	up to 8	2	1

Option 7
Extension flue upwards and horizontal using a third 90º bend



Maximum length (m)		Components required			
60/100	N/A	N/A	N/A	N/A	N/A
80/125	7	1	up to 6	3	1

Option 8
Side flue extension using two 45º bends



Maximum length (m)		Components required		
60/100	2.5	1	up to 2	2
80/125	11	1	up to 10	2

Greenstar Highflow CDi combi boiler vertical fluing options

Greenstar Highflow CDi combis offer a choice of 2 different sized vertical RSF systems, 100mm diameter and 125mm diameter. Both systems have different maximum lengths. Options 1 to 3 detail the permissible lengths.

Vertical RSF flue

Flue diameter	100mm	125mm
Flue terminal assembly diameter	120mm	135mm
Maximum flue length (inc. terminal)	6,400mm	15,000mm
Flue terminal assembly length	1,140mm	1,365mm

Vertical balanced flue kit

Comprises:

1 x flue terminal assembly
1 x weather sealing collar
1 x fire stop spacer
1 x vertical flue adaptor
1 x wall bracket
1 x flue adaptor

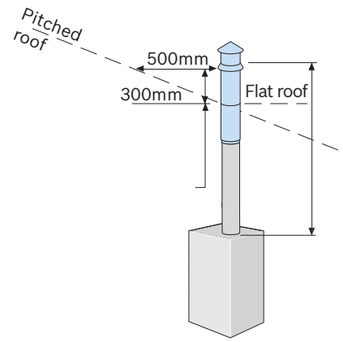
Part No. 7 716 191 156 (100mm dia.)
Part No. 7 716 191 158 (125mm dia.)

Accessories

Components	Part no.	Description
	7 716 191 156	60/100 Vertical 1,140mm kit
	7 716 191 083	60/100 1m extension
	7 716 191 084	60/100 90º bend
	7 716 191 085	60/100 45º bend
	7 716 191 133	60/100 Short flue extension
	7 716 191 158	80/125 Vertical 1,365mm kit
	7 719 001 892	80/125 1m extension
	7 719 001 891	80/125 90º bend
	7 719 001 899	80/125 45º bend

Option 1

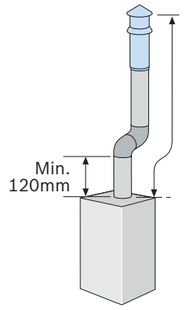
Vertical balanced flue assembly



Maximum length (m)		Components required	
60/100	6.4	1	up to 6
80/125	15	1	up to 14

Option 2

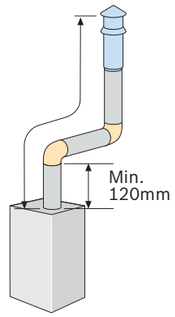
Vertical balanced flue using two 45º bends



Maximum length (m)		Components required		
60/100	4.9	1	up to 5	2
80/125	13	1	up to 12	2

Option 3

Vertical balanced flue using two 90º bends



Maximum length (m)		Components required		
60/100	3.4	1	up to 3	2
80/125	11	1	up to 10	2

Plume management system options

Plume management system

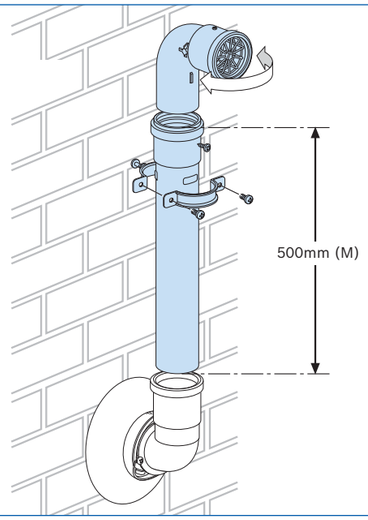
60mm dia. plume management kit
Comprises:
1 x terminal elbow
1 x extension 500mm
1 x outlet assembly
1 x clamp pack
Part No. 7 716 191 086

Accessories

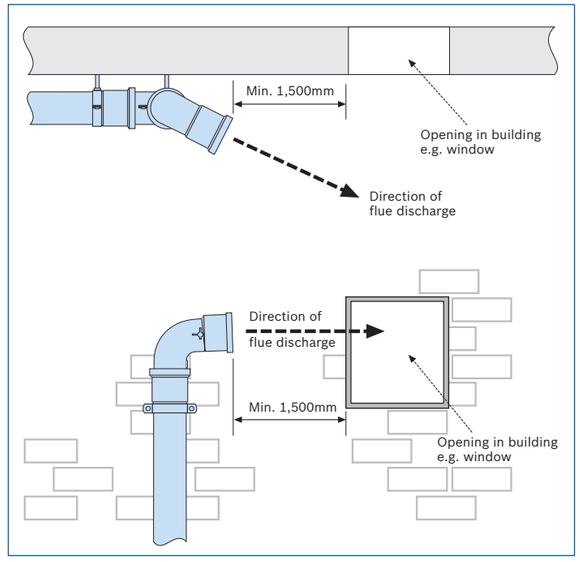
Components	Part no.	Description
	7 716 191 086	60mm dia. Plume management kit
	7 716 191 087	60mm dia. Extension (1,000mm)
	7 716 191 088	60mm dia. 90º Bend
	7 716 191 089	60mm dia. 45º Bend (pair)

Standard plume management system
The flue terminal outlet has built-in stops to limit rotation for horizontal fluing to allow condensate to run back into the boiler for safe disposal. Do not attempt to force beyond the limit stops.

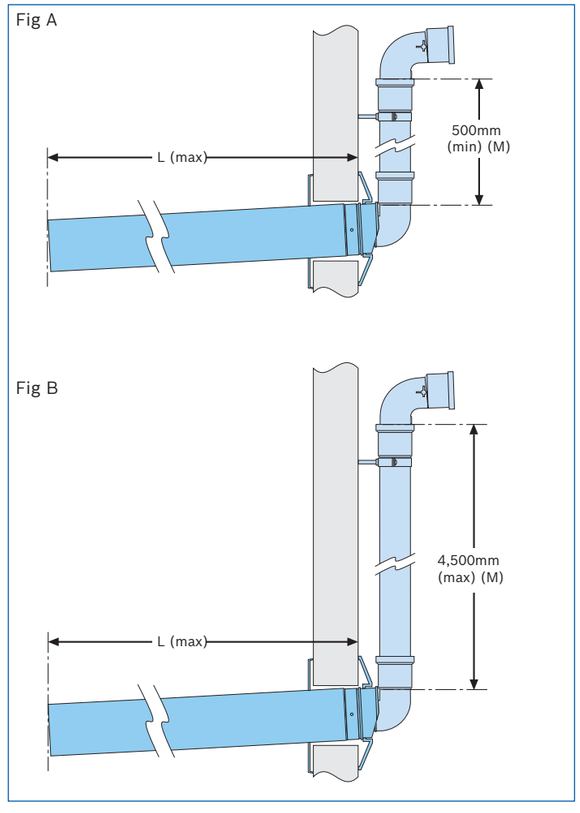
All plume management sections must rise by at least 173mm per metre (10º) from the terminal to ensure that condensate flows back into the boiler.



Re-directing flue discharge from a 60mm dia. plume management outlet



Condensfit II telescopic flue and plume management system measuring



Effective straight flue lengths for telescopic flue with plume management		
Model	**Fig. A Max. straight flue length (L) with min. plume management length (M)* (mm)**	**Fig. B Max. straight flue length (L) with max. plume management length (M)* (mm)**
Highflow 440CDi**	4,000	1,200
Highflow 550CDi**	4,000	1,200

NOTE:
Plume management minimum straight length = 500mm
Plume management maximum straight length = 4,500mm
****For every additional 1,000mm of plume management length (M), reduce flue length (L) by 700mm – see figures A and B.**

Condensfit II telescopic flue and plume management system measuring

100mm dia. horizontal telescopic flue lengths with a 60mm dia. plume management system
The maximum effective straight flue lengths (L) are stated opposite for the relevant appliance together with the minimum and maximum lengths (M) of the plume management system connected, these lengths must not be exceeded.

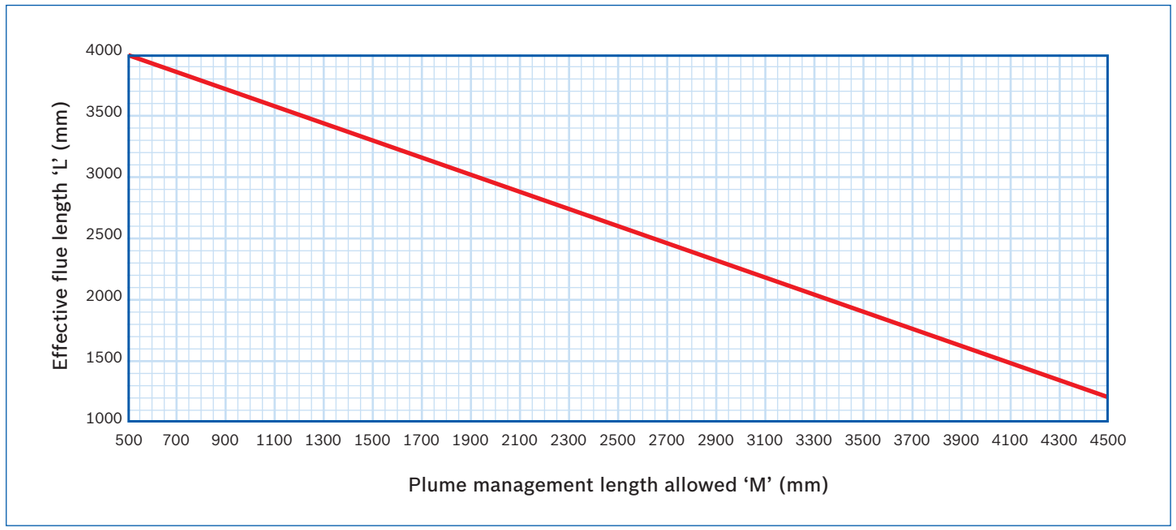
60mm dia. plume management system
To ensure that the maximum total straight flue length along the plume management route is not exceeded the following should be added to dimension (M):

- 1,500mm for each extra 90º bend
- 750mm for each extra 45º bend

For plume management options with 60mm dia. extensions refer to page 26.

Note: For information on the Condensfit II Telescopic Flue System and Plume Management Kit, please see dedicated flue Technical and Specification leaflet 8 716 112 174.

Flue length ‘L’ versus plume management kit



Use the graph above to determine the permissible plume management length that can be used with your effective flue length ‘L’.

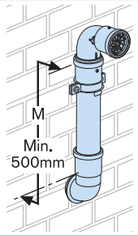
The effective flue length can be determined by adding together all the straight flue lengths and the effective lengths of the bends used, 1,500mm for each 90º bend and 750mm for each 45º bend.

Plume management options

See tables below for details of components required.

Option 1

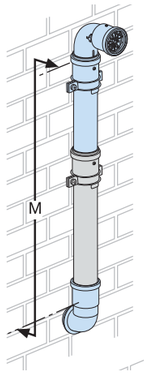
Plume management system



Maximum length (mm)		Components required
Greenstar Highflow CDi series		
60mm	500*	1

Option 2

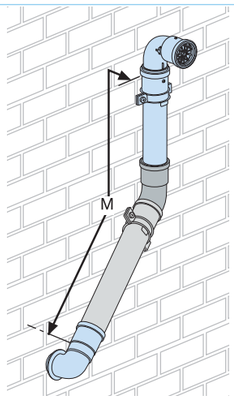
Plume management system with extensions



Maximum length (mm)		Components required	
Greenstar Highflow CDi series			
60mm	4,500*	1	up to 4

Option 3

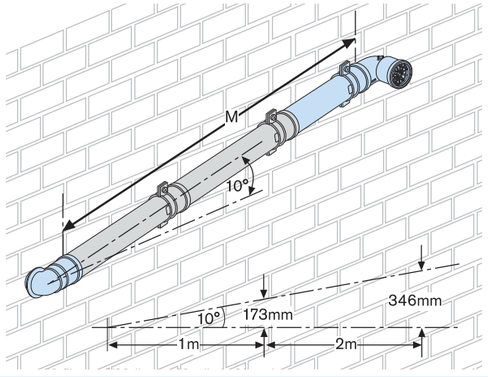
Plume management system with extensions and 45º bend



Maximum length (mm)		Components required		
Greenstar Highflow CDi series				
60mm	3,750*	1	up to 4	1

Option 4

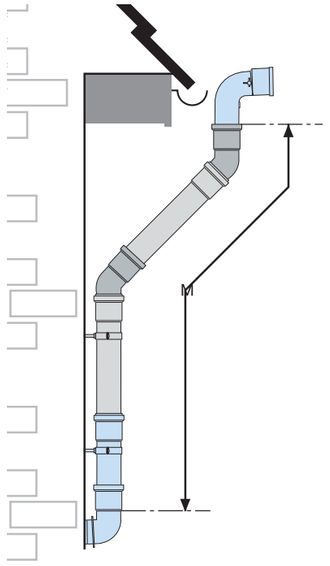
Plume management system with angled termination



Maximum length (mm)		Components required	
Greenstar Highflow CDi series			
60mm	4,500*	1	up to 4

Option 5

Plume management system with extensions and 45º bends



Maximum length (mm)		Components required		
Greenstar Highflow CDi series				
60mm	3,000*	1	up to 3	2

***NOTE: You must refer to the table on page 25 to calculate your horizontal flue lengths and plume management length.**

***NOTE: You must refer to the table on page 25 to calculate your horizontal flue lengths and plume management length.**

Installation requirements

Installation of Greenstar Highflow CDi combis must be in accordance with the relevant requirements of the Gas Safety (Installation Use) Regulations at the time of installation, current IEE Wiring Regulations, local Building Regulations, Building Standards (Scotland) regulations and bylaws of the local Water company and Health and Safety Document No. 635 (Electricity at Work Regulations 1989). It should be in accordance with the relevant recommendations of the following British Standards:

BS 6798; BS 5449; BS 5546:1; BS 5440:1; BS 5440:2; BS 6891.

Gas Safety (Installation and Use) Regulations. All gas appliances must be installed by a Gas Safe registered person in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution.

The manufacturers notes must not be taken in any way as overriding statutory regulations.

Sealed primary systems

Worcester Greenstar Highflow CDi combis are supplied complete with all the necessary components to form a sealed primary system. Included are a pre-plumbed expansion vessel (12 litres), a pressure relief valve (set at 3bar), an automatic air vent and a pressure gauge.

The expansion vessel fitted to the appliance will accommodate differing system volumes, depending upon its initial charge pressure, and system pre-pressurisation. The table below shows the system volume that can be accommodated under different conditions. If it is found that the system volume exceeds that catered for by the expansion vessel fitted within the appliance, then an extra vessel should be added as close to the appliance as possible in the heating return pipe. Refer to BS 5449:1 and BS 6798:1 for further information.

Total system volume – litres (gallons)			
Initial system pressure (bar)	Initial charge pressure (bar) 0.5	1.0	1.5
0.5	130 (29)	–	–
1.0	80 (17.5)	102 (22.5)	–
1.5	43 (9.5)	58 (13)	71 (15.5)
2.0	20 (4.5)	27 (5.9)	33 (7.5)

System filling and make-up
To comply with the Water Authority requirements, the system should be filled via a temporary hose connection to the mains cold water supply, with a double check valve assembly and a test point fitted to the mains water side of the temporary circuit. This is supplied within the boiler.

Valves and joints
It is very important that all valves and joints are able to sustain a working pressure of up to 3bar (45psi). Particular care should be exercised when fitting radiator valves and only those of high quality to BS 2767:10 should be used. All other valves and fittings should comply with BS 1010.

Loss of water pressure from a sealed system will require continuous recharging with fresh water and consequential introduction of air. Air is highly corrosive and will considerably reduce life expectancy of radiators, pumps etc.

Plastic pipework
The use of plastic pipework is acceptable. However, some plastics are permeable to oxygen and must be avoided. Only pipework with a polymeric barrier should be used. Please note that the first 600mm of pipework connected to the boiler must be copper.

Open vented primary systems

It is not permissible to install a Greenstar Highflow CDi combi on an open vent system.

Natural gas supply

Appliances, when on a full output demand, will require up to 3.1m³/hr of gas for the 440CDi and 4.4m³/hr of gas for the 550CDi. The gas meter and supply pipes must be capable of supplying this quantity of gas in addition to the demand from any other appliance being served. It is important that a gas supply pipe of at least 22mm diameter is used. Under no circumstances should the size of the gas supply pipe be less that of the appliance inlet connection. The meter outlet should be capable of ensuring a nominal pressure of 20mbar (8in wg) at the appliance. Particular consideration should be given to the resistance to gas flow created by elbows, bends etc. Pipework should be sized to overcome this resistance, details of this are given in the table below.

	Total length of gas supply pipe (m)			Pipe diameter (mm)
	3	6	9	–
Gas discharge rate m³/h	2.9	–	–	15
	8.7	5.8	4.6	22
	18.0	12.0	9.4	28

Approximate additional length to be allowed (natural gas)

Elbows or tees		90º bends	
Metres	Feet	Metres	Feet
0.50	2	0.3	1

Liquid Petroleum Gas (LPG) supply

An LPG kit is an available accessory for Greenstar Highflow CDi combis. The appliances, when on a hot water or full output demand, will require up to 2.3kg/hr of gas for the 440CDi and 3.2kg/hr of gas for the 550CDi. The gas tank or bottles must be capable of supplying this quantity of gas at a nominal pressure of 37mbar (14.8in wg) at the appliance. The table below shows the LPG discharge through varying lengths of pipe and the resistance to flow created by elbows, bends etc. Pipework should be sized so as to overcome this resistance.

	Total length of gas supply pipe (m)			Pipe diameter (mm)
	3	6	9	–
Gas discharge rate m³/h	8.0	5.2	4.2	22
	15.9	8.8	8.3	28

Approximate additional length to be allowed (LPG)

Elbows or tees		90º bends	
Metres	Feet	Metres	Feet
0.6	2	0.3	1

Electricity supply

A 3amp fused three pin plug and unswitched shuttered socket outlet (both complying with BS 1363) or preferably a double pole isolator with a contact separation of 3mm in all poles supplying the appliance should be used.

The appliance electrical circuits are also protected by an internal 2.5amp fuse. The appliance must be earthed.

Mains cold water supply

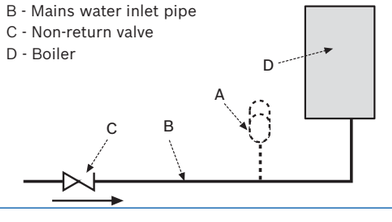
Water Authority requirement
A direct mains cold water connection is permitted by Water Authorities, however, it is recommended that reference be made to local requirements. In the event of difficulty contact the Worcester Technical Support Department.

Pipe sizing
Unless the mains pressure is low, a standard 22mm diameter service pipe is normally suitable. A 22mm hot water distribution pipe to the first branch is recommended thereafter 15mm and/or 10mm to all draw off points.

Cold water connection
Wherever possible the cold supply to the appliance should be the first connection off the mains supply, in order to minimise hot water flow reduction when cold water services are operated. The final 600mm of piping to the appliance should be of copper only.

Cold water pressure
To achieve the stipulated flow rates of 20l/min (4.4gpm)/ 25l/min (5.5gpm) a working cold water mains pressure of 1.5bar/1.7bar is required. The appliance will operate at a minimum working pressure of only 0.5bar (7.5psi) however a reduced hot water flow rate should be expected.
Back-flow prevention devices, including water meters, can prevent the expansion of hot water into the cold water main. However, this can result in a pressure build-up that may cause damage to the boiler and household devices such as showers, washing machines etc. In these cases we recommend that a mini-expansion vessel (Part No. 7 716 192 105) be fitted adjacent to the boiler in the cold water main.

MAINS WATER EXPANSION VESSEL:
A - Mini expansion vessel, Part No. 7 716 192 105
B - Mains water inlet pipe
C - Non-return valve
D - Boiler



Hot water supply

As with all mains fed systems, the flow rate of water obtainable from individual taps will vary in relation to the number of taps operating simultaneously, and will depend upon the cold mains supply available to the property.

Therefore, in order to avoid excessive starvation of flow to individual taps, flow balancing may be required by the use of proprietary constant volume flow regulators or Ball-o-Fix valves.

Hot water systems

Taps and valves
Hot and cold taps and mixing valves used with Greenstar Highflow CDi appliances must be suitable for operating at a mains pressure of up to 10bar (150psi) and temperatures of 65°C (150°F).

Showers
When a loose head shower with a flexible hose is used over a bath or shower tray, the hose must be fixed so that the head cannot fall closer than 25mm (1in) above the top edge of the spill over level of the relevant bath or shower tray. Alternatively, the feed pipes to the shower should incorporate a double check valve assembly or a check valve and vacuum breaker.

With fixed head showers no provision is necessary.

The use of a thermostatically controlled shower will give added comfort and safeguard against high hot water temperatures.

Bidet
The supply of hot and cold water mains direct to a bidet is permitted provided that the bidet is of the overrim water feed type. The outlet(s) should be shrouded and not have any temporary hand held spray attached. No other anti-syphonage arrangements are necessary.

Use in hard water areas

As the maximum temperature of the domestic hot water heat exchanger is limited by the electronic control circuit, there is normally no need for water treatment to prevent scale accumulation.

In areas where exceptional water conditions prevail, consideration may need to be given to the fitting of a device capable of preventing scale. In such circumstances the advice of the local water authority should be sought.

Warranty

Worcester Greenstar Highflow CDi appliances are offered with a full 2 year guarantee* on parts and labour, a 10 year warranty* on the primary heat exchanger and a 5 year warranty* on the plate heat exchanger. Ongoing service and maintenance contracts can be arranged through the Worcester Customer Service Department.

**Subject to conditions.*

Greenstar Highflow CDi series accessories

MT10 mechanical timer

Worcester Part No.
7 716 192 036

MT10RF mechanical RF thermostat

Worcester Part No.
7 716 192 037

DT20 twin channel digital programmer

Worcester Part No.
7 716 192 038

DT20RF digital RF thermostat with twin channel programmer

Worcester Part No.
7 716 192 054

DT10RF digistat

Worcester Part No.
7 716 192 052

DT10RF optimiser

Worcester Part No.
7 716 192 053

RT10 room thermostat

Worcester Part No.
7 719 002 505

TD200 text display

Worcester Part No.
7 719 002 506

Text display wall mounting socket

Worcester Part No.
7 719 002 718

RS telescopic flue kit (100mm dia.)

Worcester Part No.
7 716 191 155

Horizontal flue kit (125mm dia.)

Worcester Part No.
7 716 191 157

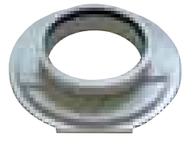
Vertical BF kit (100mm dia.)

Worcester Part No.
7 716 191 156

Vertical BF kit (125mm dia.)

Worcester Part No.
7 716 191 158

Vertical flue adaptor (60/100mm)



Worcester Part No.
7 716 191 164

Vertical flue adaptor (80/125mm)

Worcester Part No.
7 716 191 165

1,000mm extension kit (100mm dia.)

Worcester Part No.
7 716 191 083

Note: For information on the Condensfit II Telescopic Flue System and Plume Management Kit, please see dedicated flue Technical and Specification leaflet 8 716 112 174.

Greenstar Highflow CDi series accessories

Short flue extension 220mm (100mm dia.)

Worcester Part No. 7 716 191 133

1,000mm extension (125mm dia.)

Worcester Part No. 7 719 001 892

45º bend (100mm dia.)

Worcester Part No. 7 716 191 085

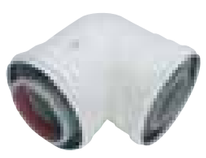
45º bend (125mm dia.)

Worcester Part No. 7 719 001 899

90º bend (100mm dia.)

Worcester Part No. 7 716 191 084

90º bend (125mm dia.)



Worcester Part No. 7 719 001 891

Support bracket kit (100mm dia.)

Worcester Part No. 7 716 191 092

Plume management kit (60mm dia.)

Worcester Part No. 7 716 191 086

Extension (60mm dia., 1,000mm)

Worcester Part No. 7 716 191 087

90º bend (60mm dia.)

Worcester Part No. 7 716 191 088

45º bend (60mm dia.)

Worcester Part No. 7 716 191 089

Flat roof flashing kit (100mm & 125mm dia.)

Worcester Part No. 7 716 191 090

Pitched roof flashing kit (100mm & 125mm dia.)

Worcester Part No. 7 716 191 091

Note: For information on the Condensfit II Telescopic Flue System and Plume Management Kit, please see dedicated flue Technical and Specification leaflet 8 716 112 174.

A complete after-sales service

As part of the worldwide Bosch Group, Worcester strives to maintain the highest possible standards of after-sales care.

In addition to the no-nonsense parts and labour warranty applicable to all Worcester boilers, you and your customers have the assurance that every Worcester boiler is manufactured to both the appropriate British and European standards.

Worcester Contact Centre

Should you require support, our fully trained Contact Centre staff, based at our head office in Worcester, are ready to take your calls. Whatever your query our contact centre operators along with our nationwide team of engineers are ready to help you.

Boiler Protection Options

Worcester offers boiler protection including service and maintenance contracts. Please call the Worcester Contact Centre for further details.

If you do not offer annual service and maintenance contracts please refer your customers to the Worcester Contact Centre:

Tel: 08457 256 206
Fax: 01905 757 536

Opening Times

Monday – Friday: 7.00am – 8.00pm
Saturday: 8.00am – 5.00pm
Sunday: 9.00am – 12 noon

All the technical advice you need

Spares

Genuine replacement parts for all Worcester boilers are readily available from stock, on a next day delivery basis. For more information please call your local stockist. You can find a spares stockist on our website.

Customer Technical Support

The Worcester Technical Helpline is a dedicated phone line – committed to providing a comprehensive service to complement the brand name and quality of our products. Our experienced team of technical experts provides answers to queries of a technical nature across the entire Worcester range.

Worcester also has a pre-sales department, which provides assistance in selecting a boiler system to suit a particular application, along with full guidance on installation. As well as this we will also assist in finding a recommended installer. For more information please contact the Technical Helpline or alternatively visit our website where literature can be downloaded at **www.worcester-bosch.co.uk**

Technical

Tel: 08705 266 241
Fax: 01905 752 741

Opening Times

Monday – Friday: 7.00am – 8.00pm
Saturday: 8.30am – 4.00pm

The very best training programmes from Worcester

Worcester has always placed great emphasis on technical support and training for installers and service engineers. Today this need is greater than ever. The differences between a combi, conventional and system boiler are substantial, and the technology of each continues to advance at a rapid pace.

With the increase of renewables technologies in the UK, the need for training has never been greater.

To ensure the highest levels of competence and expertise in the installation of all Worcester products, the company runs intensive training courses for installers, commissioning engineers and operatives involved with servicing and fault finding.

Courses available

Our training facilities offer a number of courses suitable for the installer and commissioning engineers, and a more in-depth course for the servicing and fault finding engineers.

Training lab at West Thurrock Academy

Training Centres throughout the UK

Worcester's network of regional training venues is strategically located across the country and includes our state-of-the-art Academy at the Company Headquarters in Worcester. This facility has recently been upgraded to include a heat pump training lab, showcasing our range of ground and air source heat pumps.

Further academies are located at West Thurrock in Essex, Bradford, Clay Cross in Derbyshire and Bangor in Northern Ireland, all offering our full suite of courses. Please phone 01905 752526 for more information about a course near you. Each course is run by specialist trainers and is superbly equipped to deliver a combination of classroom theory and practical hands-on experience that's second to none.

College-linked Learning

As well as offering training at our own centres, Worcester has established close partnerships with many colleges around the UK, equipping them with our latest products. Call us on 01905 752526 to find out when we will be running the course of your choice at a college in your area.

Mobile training

To complement our training venues across the country, we can also bring training to you.

We have mobile vehicles fully equipped with operational Greenstar gas-fired boilers, dry strip-down models and even a Greensource Air to Air Heat Pump, ensuring that quality training in a comfortable environment can be achieved on your doorstep!

If it's oil training you require, our 7.5 tonne mobile oil vehicle is available throughout the country for hands-on product training and OFTEC assessments.

Distance Learning/Web Based Learning

Worcester has produced a selection of Distance Learning CD ROMs/DVDs which are packed with information. Call 01905 752556 for your copies, or visit www.worcester-bosch.co.uk for information on Web Based Learning.

Get on course for a more profitable future now.

Call now for more information 01905 752526

www.worcester-bosch.co.uk

Worcester training courses

One stop shop training

We are here to provide you with training and assistance for all areas of your business, not just product training. IT Skills and Sales & Marketing are just 2 of the courses we now offer to help your business grow. Call us on 01905 752526 to order a full training course portfolio.

Worcester training courses	
Greenstar CDi gas-fired condensing combi boilers	
Models covered	Greenstar 27/30/37/42CDi
Duration	1 day
Greenstar i Junior & Si gas-fired condensing combi boilers	
Models covered	Greenstar 24/28i Junior Greenstar 25/30Si
Duration	1 day
Greenstar Highflow CDi & FS CDi regular floor standing gas-fired condensing combi and regular boilers	
Models covered	Greenstar Highflow 440/550CDi Greenstar FS 30/42CDi Regular
Duration	1 day
Greenstar system & regular gas-fired condensing boilers	
Models covered	Greenstar 12/15/18/24Ri Greenstar 30/40CDi Conventional Greenstar FS 30/42CDi Regular Greenstar 30CDi System Greenstar 12/24i System
Duration	1 day
Greenstar FX controls	
Models covered	MT10/MT10RF/DT20RF/DT20/DT10RF/TD200/RT10/FR10/FR110/FW100/ISM1
Duration	1 day
Greenstar Danesmoor, Heatslave & Camray high efficiency condensing oil-fired boilers – pre-OFTEC training	
Models covered	Greenstar Danesmoor series Greenstar Heatslave series Greenstar Camray series
Duration	1 day
Greenskies solar system	
Covering	Installation, Commissioning and Servicing
Duration	2 days
Greenstore ground source heat pumps	
Covering	Installation, Commissioning and System Design
Duration	2 days
Greensource heat pumps – air to water	
Covering	Installation, Commissioning and System Design
Duration	2 days
Greensource heat pumps – air to air	
Covering	Installation, Commissioning and System Design
Duration	1 day

OFTEC ASSESSMENT	
OFTEC 101	
Covering	Domestic/Light Commercial Pressure Jet Commissioning and Servicing
Duration	3 day course
OFTEC 105e	
Covering	Domestic/Light Commercial Pressure Jet Boiler Installation
Duration	1 day assessment
OFTEC 101 & 105e	
Covering	Domestic/Light Commercial Pressure Jet Installation, Commissioning and Servicing
Duration	3 day course
OFTEC 600a	
Covering	Oil Tank Installation and Associated Controls
Duration	1 day assessment course
OFTEC 101/105e/600e	
Covering	Domestic/Light Commercial Pressure Jet Boiler Installation, Commissioning, Servicing and Oil Tank Installation and Associated Controls
Duration	4 days
Mobile OFTEC	
All above covered throughout the country on the mobile training vehicle as well as in all our centres.	
Unvented cylinder course	
Covering	All G3 Regulations for the Installation, Servicing and Commissioning of Unvented Cylinders. This course is certified by Logic Certification.
Duration	1 day
Chemical water treatment	
Covering	Water treatment of domestic heating systems in accordance with BS 7593: 2006
Duration	1 day

NB: Please note to attend OFTEC courses you must have a minimum of 12 months' experience installing/servicing oil boilers. For inexperienced candidates, our Greenstar Danesmoor, Heatslave and Camray course offers pre-OFTEC training.

Useful numbers

Sales
Tel: 01905 752640
Fax: 01905 456445

Contact Centre
Tel: 08457 256206
Fax: 01905 757536
Livingston (Scotland)
Fax: 01506 441687

Spare Parts
Tel: 01905 752576
Fax: 01905 754620

Training
Tel: 01905 752526
Fax: 01905 752535

Technical (Pre & Post Sales)
Tel: 08705 266241
Fax: 01905 752741

Literature Line
Tel: 01905 752556
or download instantly
from our website

www.worcester-bosch.co.uk

The Council for Registered Gas Installers (N. Ireland only)

In partnership with energy saving trust™

HEATING & HOTWATER INDUSTRY COUNCIL

The mark of quality for domestic heating

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WORCESTER
Bosch Group
Worcester, Bosch Group,
Cotswold Way, Warndon,
Worcester, WR4 9SW
Tel: 01905 754624 Fax: 01905 754619